

WHAT IS CLAIMED IS:

1        1. A method of updating a compressed cache comprising  
2        the steps of:

3                initiating an update routine for replacing first  
4        data stored within the cache with second data, wherein a  
5        first section of a compressed data band stored in the cache  
6        includes the first data and a second section of the  
7        compressed data band includes third data; and

8                in response to initiating the update routine,  
9        replacing the first data within the compressed data band  
10      with the second data without decompressing the third data.

1        2. The method of claim 1, wherein the update routine  
2        includes one of a destage operation and a write operation.

1        3. The method of claim 1, wherein the step of  
2        replacing comprises:

3                determining whether the second data is compressed;  
4        and

5                compressing the second data if the second data is  
6        uncompressed.

1        4. The method of claim 1, wherein the step of  
2        replacing comprises:

3                determining whether the second data is compressed;  
4                comparing a first compression factor of the first  
5        data with a second compression factor of the second data if  
6        the second data is compressed; and

7                determining, based on the comparison step, whether  
8        one or more resources in the compressed cache utilized by

9       the first data are sufficient to accommodate the second  
10      data.

1           5.   The method of claim 4 further comprising the step  
2      of:

3               supplementing the one or more resources utilized  
4      by the first data with a number of additional resources so  
5      as to accommodate the second data if the one or more  
6      resources utilized by the first data are insufficient to  
7      accommodate the second data.

1           6.   The method of claim 5 wherein the step of  
2      supplementing comprises the steps of:

3               receiving a request for a number of additional  
4      resources sufficient to accommodate the second data when  
5      combined with the one or more resources utilized by the  
6      first data;

7               determining whether a reserve of available  
8      resources has the number of additional resources; and

9               allocating the number of additional resources from  
10     the reserve of available resources if the reserve of  
11     available resources has the number of additional resources.

1           7.   The method of claim 5 wherein the step of  
2      supplementing comprises the steps of:

3               receiving a request for a number of additional  
4      resources sufficient to accommodate the second data when  
5      combined with the one or more resources utilized by the  
6      first data;

7                   determining whether the number of additional  
8    resources is greater than a predetermined number of  
9    resources, and if so:

10                  determining whether a number of available  
11    resources in a reserve of available resources exceeds a  
12    predetermined threshold; and

13                  granting the request for the number of  
14    additional resources if the number of available resources in  
15    the reserve of available resources exceeds the predetermined  
16    threshold.

1                8. The method of claim 5 wherein the step of  
2    supplementing comprises the steps of:

3                  determining whether a reserve of available  
4    resources has a number of additional resources sufficient to  
5    accommodate the second data when combined with the one or  
6    more resources utilized by the first data; and

7                  performing a pillage process if the reserve of  
8    available resources has an insufficient number of additional  
9    resources to accommodate the second data when combined with  
10    the one or more resources utilized by the first data.

1                9. The method of claim 8 wherein the step of  
2    performing the pillage process comprises the steps of:

3                  identifying a cache line record of the compressed  
4    cache that is in an idle state;

5                  calculating a figure of merit for the identified  
6    cache line record;

7 adding any cache resources associated with the  
8 cache line record to the reserve of available resources if  
9 the figure of merit is less than a predetermined value; and  
10 if the reserve of available resources has a number  
11 of additional resources sufficient to accommodate the second  
12 data when combined with the one or more resources utilized  
13 by the first data, supplementing the one or more resources  
14 utilized by the first data with the available resources in  
15 the reserve to accommodate the second data.

1        10. The method of claim 9 wherein the cache line  
2 record includes a plurality of page table entry set  
3 pointers, each page table entry set pointer pointing to a  
4 predetermined number of page table entries, wherein each of  
5 the cache resources is separately addressable by a  
6 respective page table entry.

1 11. The method of claim 4 further comprising the step  
2 of:

3                   replacing the first data in the compressed cache  
4 with the second data if the one or more resources are  
5 sufficient to accommodate the second data.

1                   12. The method of claim 11 further comprising the  
2 steps of:

3 determining, after the replacing step, whether at  
4 least one of the one or more resources utilized by the first  
5 data has become available; and

6                   allocating the at least one of the one or more  
7                   resources into a reserve of available resources if the at  
8                   least one of the one or more resources has become available.

1                 13. The method of claim 4 wherein each of the one or  
2                   more resources utilized by the first data is individually  
3                   addressable by a corresponding page table entry.

1                 14. A method of updating a compressed cache,  
2                   comprising the steps of:

3                   initiating an update routine for replacing first  
4                   data stored within the cache with second data, wherein a  
5                   first section of a compressed data band stored in the cache  
6                   includes the first data and a second section of the  
7                   compressed data band includes third data; and

8                   in response to initiating the update routine:

9                   supplementing one or more resources utilized  
10                  by the first data with a number of additional resources so  
11                  as to accommodate the second data if the one or more  
12                  resources utilized by the first data are insufficient to  
13                  accommodate the second data; and

14                  replacing the first data within the  
15                  compressed data band with the second data without  
16                  decompressing the third data.

1                 15. The method of claim 14 wherein the step of  
2                   supplementing comprises the steps of:

3                   receiving a request for a number of additional  
4                   resources sufficient to accommodate the second data when

5 combined with the one or more resources utilized by the  
6 first data;

7 determining whether a reserve of available  
8 resources has the number of additional resources; and  
9 allocating the number of additional resources from  
10 the reserve of available resources if the reserve of  
11 available resources has the number of additional resources.

1 16. The method of claim 14 wherein the step of  
2 supplementing comprises the steps of:

3 receiving a request for a number of additional  
4 resources sufficient to accommodate the second data when  
5 combined with the one or more resources utilized by the  
6 first data; and

7 determining whether the number of additional resources  
8 is greater than a predetermined number of resources, and if  
9 so:

10 determining whether a number of available  
11 resources in a reserve of available resources exceeds a  
12 predetermined threshold; and

13 granting the request for the number of additional  
14 resources if the number of available resources in the  
15 reserve of available resources exceeds the predetermined  
16 threshold.

1 17. The method of claim 14 wherein the step of  
2 supplementing comprises the steps of:

3 determining whether a reserve of available  
4 resources has a number of additional resources sufficient to

5 accommodate the second data when combined with the one or  
6 more resources utilized by the first data; and

7 performing a pillage process if the reserve of  
8 available resources has an insufficient number of additional  
9 resources to accommodate the second data when combined with  
10 the one or more resources utilized by the first data.

1 18. The method of claim 17 wherein the step of  
2 performing the pillage process comprises the steps of:

3 identifying a cache line record of the compressed  
4 cache that is in an idle state;

5 calculating a figure of merit for the identified  
6 cache line record;

7 adding any cache resources associated with the  
8 cache line record to the reserve of available resources if  
9 the figure of merit is less than a predetermined value; and

10 if the reserve of available resources has a number  
11 of additional resources sufficient to accommodate the second  
12 data when combined with the one or more resources utilized  
13 by the first data, supplementing the one or more resources  
14 utilized by the first data with the available resources in  
15 the reserve to accommodate the second data.

1 19. The method of claim 18 wherein the cache line  
2 record includes a plurality of page table entry set  
3 pointers, each page table entry set pointer pointing to a  
4 predetermined number of page table entries, wherein each of  
5 the cache resources is separately addressable by a  
6 respective page table entry.

1           20. A compressed read cache system, comprising:  
2                   a compressed read cache configured to store data;  
3                   and

4                   a controller operatively coupled to the cache and  
5                   configured to:

6                           initiate an update routine for replacing  
7                           first data stored within the cache with second data, wherein  
8                           a first section of a compressed data band stored in the  
9                           cache includes the first data and a second section of the  
10                           compressed data band includes third data; and

11                           in response to initiating the update routine,  
12                           replace the first data within the compressed data band with  
13                           the second data without decompressing the third data.

14           21. The system of claim 20, wherein the controller is  
15                   further configured to:

16                           determine whether the second data is compressed;  
17                           compare a first compression factor of the first  
18                           data with a second compression factor of the second data if  
19                           the second data is compressed; and

20                           determine, based on the comparison of the first  
21                           and second compression factors, whether one or more  
22                           resources in the cache utilized by the first data are  
23                           sufficient to accommodate the second data.

24           22. The system of claim 21 further including a  
25                   compression unit operatively coupled to said controller,  
26                   said compression unit configured to compress the second data  
27                   if the controller determines that the second data is  
28                   uncompressed.

1           23. The system of claim 21, wherein the controller is  
2 further configured to supplement the one or more resources  
3 utilized by the first data with a number of additional  
4 resources so as to accommodate the second data if the one or  
5 more resources utilized by the first data are insufficient  
6 to accommodate the second data.

1           24. The system of claim 23 wherein the controller is  
2 further configured to:

3           receive a request for a number of additional  
4 resources sufficient to accommodate the second data when  
5 combined with the one or more resources utilized by the  
6 first data;

7           determine whether a reserve of available resources  
8 has the number of additional resources; and

9           allocate the number of additional resources from  
10 the reserve of available resources if the reserve of  
11 available resources has the number of additional resources.

12           25. The system of claim 23 wherein the controller is  
13 further configured to:

14           receive a request for a number of additional  
15 resources sufficient to accommodate the second data when  
16 combined with the one or more resources utilized by the  
17 first data;

18           determine whether the number of additional  
19 resources is greater than a predetermined number of  
resources, and if so:

10                   determine whether a number of available  
11 resources in a reserve of available resources exceeds a  
12 predetermined threshold; and

13                   grant the request for the number of  
14 additional resources if the number of available resources in  
15 the reserve of available resources exceeds the predetermined  
16 threshold.

1       26. The system of claim 23 wherein the controller is  
2 further configured to:

3                   determine whether a reserve of available resources  
4 has a number of additional resources sufficient to  
5 accommodate the second data when combined with the one or  
6 more resources utilized by the first data; and

7                   perform a pillage process if the reserve of  
8 available resources has an insufficient number of additional  
9 resources to accommodate the second data when combined with  
10 the one or more resources utilized by the first data.

1       27. The system of claim 26 wherein when the controller  
2 performs the pillage process, the controller is further  
3 configured to:

4                   identify a cache line record of the compressed  
5 cache that is in an idle state;

6                   calculate a figure of merit for the identified  
7 cache line record;

8                   add any cache resources associated with the cache  
9 line record to the reserve of available resources if the  
10 figure of merit is less than a predetermined value; and

11                   if the reserve of available resources has a number  
12 of additional resources sufficient to accommodate the second  
13 data when combined with the one or more resources utilized  
14 by the first data, supplement the one or more resources  
15 utilized by the first data with the available resources in  
16 the reserve to accommodate the second data.

1                   28. The system of claim 27 wherein the cache line  
2 record includes a plurality of page table entry set  
3 pointers, each page table entry set pointer pointing to a  
4 predetermined number of page table entries, wherein each of  
5 the cache resources is separately addressable by a  
6 respective page table entry.

1                   29. The system of claim 21, wherein the controller is  
2 further configured to replace the first data in the cache  
3 with the second data if the one or more resources are  
4 sufficient to accommodate the second data.

1                   30. The system of claim 29, wherein the controller is  
2 further configured to:

3                   determine, after replacing the first data, whether  
4 at least one of the one or more resources utilized by the  
5 first data has become available; and

6                   7                   allocate the at least one of the one or more  
8 resources into a reserve of available resources if the at  
least one of the one or more resources has become available.

1           31. The method of claim 21 wherein each of the one or  
2 more resources is individually addressable by a  
3 corresponding page table entry.

1           32. A compressed read cache system, comprising:  
2                   a compressed read cache configured to store data;  
3 and  
4                   a controller operatively coupled to the cache, and  
5 configured to:  
6                       initiate an update routine for replacing  
7 first data stored within the cache with second data, wherein  
8 a first section of a compressed data band stored in the  
9 cache includes the first data and a second section of the  
10 compressed data band includes third data; and  
11                       in response to initiating the update routine:  
12                           supplement one or more resources  
13 utilized by the first data with a number of additional  
14 resources so as to accommodate the second data if the one or  
15 more resources utilized by the first data are insufficient  
16 to accommodate the second data; and  
17                       replace the first data within the  
18 compressed data band with the second data without  
19 decompressing the third data.

1           33. A computer program product for use with a  
2 compressed read cache, comprising:  
3                   a medium readable by a computer, the computer  
4 readable medium having computer program code adapted to:  
5                       initiate an update routine for replacing  
6 first data stored within the cache with second data, wherein

7 a first section of a compressed data band stored in the  
8 cache includes the first data and a second section of the  
9 compressed data band includes third data; and

10 in response to initiating the update routine,  
11 replace the first data within the compressed data band with  
12 the second data without decompressing the third data.

1 34. A computer program product for use with a  
2 compressed read cache, comprising:

3 a medium readable by a computer, the computer  
4 readable medium having computer program code adapted to:

5 initiate an update routine for replacing  
6 first data stored within the cache with second data, wherein  
7 a first section of a compressed data band stored in the  
8 cache includes the first data and a second section of the  
9 compressed data band includes third data; and

10 in response to initiating the update routine:

11 supplement one or more resources  
12 utilized by the first data with a number of additional  
13 resources so as to accommodate the second data if the one or  
14 more resources utilized by the first data are insufficient  
15 to accommodate the second data; and

16 replace the first data within the  
17 compressed data band with the second data without  
18 decompressing the third data.